

**CONCORDIA
UNIVERSITY**



**MECHANICAL ENGINEERING
AT
CONCORDIA**

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DEPARTMENTAL REPORT
1980-1983



DEPARTMENT OF MECHANICAL ENGINEERING

Achievements and Activities

1980-1983

Dedicated to Silas Katz (1924-1982)

Compiled by:

Dr. T.S. Sankar, Chairman

Mrs. Elizabeth Horwood, Secretary to the Chairman

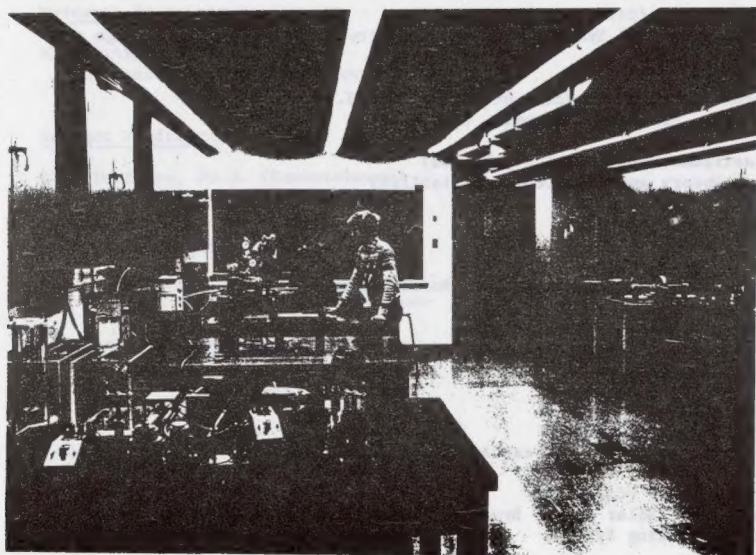
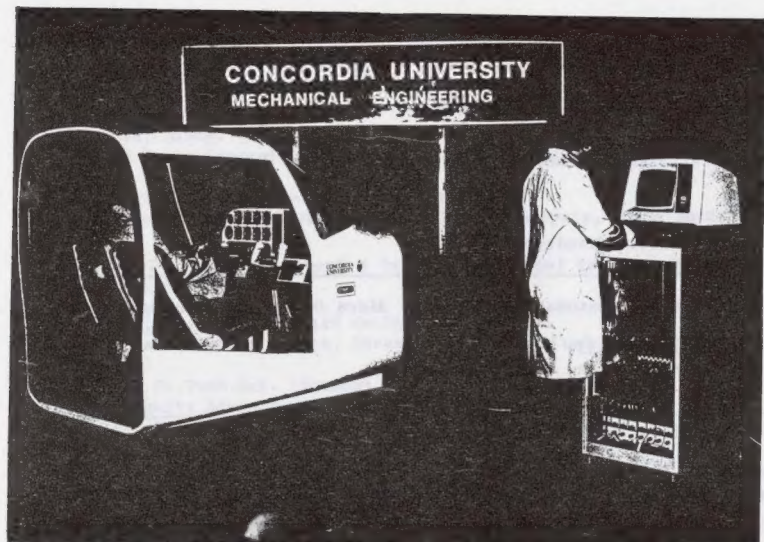
For further information, write: The Chairman's Office
(address as on front cover)
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DR. SILAS KATZ
(1924-1982)

Dr. Silas Katz, Professor of Mechanical Engineering, died on July 1st, 1982, after a brief illness. He had been associated with Concordia University since 1974 when he joined the Faculty of Engineering as Associate Professor of Mechanical Engineering, coming from the prestigious Harry Diamond Laboratories, Washington, D.C., where he pioneered research in fluidics. Dr. Katz held a BSME degree from City College of New York and an M.S. degree from the University of Maryland. His doctoral work in the field of fluidics was completed in 1970 at Oklahoma State University. Besides serving the U.S. Navy during World War II, Dr. Katz worked with the Public Buildings Service, the U.S. National Bureau of Standards and the Harry Diamond Laboratories. His research led to the publication of a book on Fluidics (1965), on Fluidic Amplifiers (1966) and on Design Theory of Fluidic Components (1975). He also published a book, co-authored with Dr. J.F. Lindsay, on the Dynamics of Physical Circuits and Systems (1978) which is used widely as an undergraduate text. His publications in journals and presentation of papers at international conferences were numerous; his final publication on pressure signal propagation in a freight-train brake-pipe with leakages was presented at the 1982 Winter Annual Meeting of the American Society of Mechanical Engineers by colleagues in the Department. Dr. Katz lectured to undergraduate students on physical systems, engineering mechanics, control theory, fluid mechanics and heat transfer, and supervised graduate students on the design of pneumatic systems and on hydraulic transients. He was Graduate Program Director for the Department and served on various university committees. As a member of the research team of the Department's Fluid Control Centre, Dr. Katz's expertise was in the development of swing-disc check valves, pneumatic brake control systems in freight trains and in the general area of fluid power and control. Dr. Katz will be remembered as a conscientious and responsive teacher, as a faculty member of unquestionable personal integrity and dedication, and as a colleague of exceptional warmth and generosity.

As a permanent tribute to this distinguished teacher and engineer and by overwhelming request from his colleagues and students, the University has set up a scholarship program which will support selected mechanical engineering students at Concordia. Contributions identified SILAS KATZ MEMORIAL SCHOLARSHIPS may be sent to the Department of Mechanical Engineering, Concordia University, 1455 de Maisonneuve Blvd. West, Montreal, Quebec, Canada, H3G 1M8.

For further information, contact Dr. T.S. Sankar, Chairman, Department of Mechanical Engineering.



MEMBERS OF THE DEPARTMENT AND THEIR RESEARCH INTERESTS

Professor and Chairman of the Department

T.S. Sankar, Ph.D. (Waterloo)
Mechanical Systems, Random Vibrations, Robotics, Reliability

Professors

R.M.H. Cheng, Ph.D. (Birmingham)
Director, Center for Industrial Control & Program Director, Graduate Studies.
Control Systems, Automation, Computer Aided Design and Manufacturing

C.K. Kwok, Ph.D. (McGill)
Fluid Control, Vortex Flows, Combustion

S. Lin, Dr.Eng. (Karlsruhe)
Heat Transfer, Solar Energy Systems

H. McQueen, Ph.D. (Notre Dame)
Social Impacts of Technology, Metallurgy, Manufacturing Processes

M.O.M. Osman, D.Sc., (Swiss Inst.Tech.)
Coordinator, Undergraduate Studies.
Mechanisms, Manufacturing Processes, Mechanical Systems

S. Sankar, D.Eng. (Sir George Williams)
Hydro-Mechanical Systems, Vibration Control, Computer-Aided Design and Optimization

Y. Stepanenko, Ph.D. (Academy of Science U.S.S.R.)
Robotics, Mechanical Systems, Simulation

K. Thulasiraman, Ph.D. (I.I.T., Madras)
Graph Theory and Algorithms, Reliability

Associate Professors

R.B. Bhat, Ph.D., (Madras)
Structural Dynamics, Acoustics, Rotor Dynamics

W.G. Habashi, Ph.D. (Cornell)
Aerodynamics, Computational Methods in Fluid Mechanics and Turbomachines

S.V. Hoa, Ph.D. (Toronto)
CSME Faculty Advisor
Composite Materials, Stress Analysis, Solid Mechanics

K.I. Krakow, M.S. (Caltech)
Heat Pumps, Solar Energy Systems, Heating, Ventilation and Airconditioning Systems

Associate Professors (cont'd)

- R.A. Neemeh, Ph.D. (McGill)
Gas Dynamics, Shock-Wave Dynamics
- J. Svoboda, D.Eng. (Concordia)
Fluid Power Control, Hydraulics, Flight Simulation
- G.D. Xistris, D.Sc.A. (Université de Montréal)
Machinery Preventive Maintenance, Signal Analysis, Solid Mechanics

Assistant Professors

- A.E. Blach, Ph.D. (Université de Montréal)
Process Equipment Design, Stress Analysis, Bolted Connections
- T. Krepec, Dr.Tech.Sci. (Warsaw)
SAE Faculty Advisor
Internal Combustion Engines, Fuel Control Systems
- V. Latinovic, D.Eng. (Concordia)
Production, Computer-Aided Manufacturing
- A.J. Saber, Ph.D. (Princeton)
Combustion, Propulsion, Environmental Safety Engineering

Research Associate Professors

- V. Fabrikant, Ph.D. (Moscow)
Classical Mechanics, Contact Problems

Adjunct Professor

- G.M. McKinnon, Ph.D. (Saskatchewan)
CAE Electronics Ltd., Montreal

Adjunct Associate Professor

- R.V. Dukkupati, Ph.D. (Oklahoma State)
National Research Council, Ottawa

Adjunct Assistant Professors

- M. Attia, Ph.D. (McGill)
Ontario Hydro
- C.D. Chomski, Ph.D. (Paris)
Pratt & Whitney Aircraft of Canada
- E. Hashish, Ph.D. (Concordia)
Spar Aerospace

Adjunct Assistant Professors (cont'd)

- D. Kenny, B.Eng. (McGill)
Pratt & Whitney Aircraft of Canada
- K. Kivenko, Diploma in Management (McGill)
Canadian Marconi Co., Montreal
- S. LeQuoc, D.Eng. (Sir George Williams)
Ecole Technologie Supérieure, Université du Québec

Full-Time Laboratory Demonstrators

- A. Fahim
H. Hong
G. Vatistas

Research/Teaching Associates

- J. Alanoly
C.N. Bapat
R. Bargiora
W. Berczynski
W. Blach
J. Bowles
D. Dres
E. Evangelista
T. Judek
R. Lee
P. Ouellette
J. Sasiadek
B. Suresh
G. Warner

Technical Staff

- Brennan, M.
Elliott, J.S.
Fitch, W
Marsman, F.
Williams, S.

Part-Time Teaching Assistants

- N. Krouglicof
S. Mah
B. Nguyen
S. Rakheja
V. Tata
M. Van Vliet

Secretarial Staff

- P. Baktis
I. Crawford
E. Horwood
B. Keshavan
C. Nadeau
L. Saab

Graduate Teaching Fellows

- A. Ahmed
A. Georgantas
N. Krouglicof
R. Pellizzari

GENERAL INFORMATION

FACULTY AND STAFF

The Mechanical Engineering Faculty is comprised of 9 professors, 7 Associate Professors, 4 Assistant Professors and several Visiting and Adjunct Professors, Research Associates and Lecturers, 4 Technical Staff, and 5 Secretaries. The faculty members are engaged in industrial as well as academic research and development; and many have gained an international reputation. There is considerable cooperation and interaction with industry. To further this cooperation many specialist courses are taught by practicing engineers and a number of faculty members act as consultants to industry. Pages 3,4,5,6,7, 8 and 9 describe the major research groups and typical projects in the Department.

LABORATORY FACILITIES

- 1) Thermodynamics Laboratory.
- 2) Fluid Mechanics and Heat Transfer Laboratory.
- 3) Kinematics and Dynamics Laboratory.
- 4) Vibration and Shock Testing Laboratory.
- 5) Machine Tool Laboratory.
- 6) Fluid Power Laboratory with 100 hp Hydraulic Test Installation.
- 7) Tribology Laboratory with Talysurf and Talyrand Surface Texture Measuring Systems.
- 8) Industrial Control Research Laboratory.
- 9) Control Systems and Automation Laboratory.
- 10) Materials Laboratory.
- 11) Solar Energy Laboratory.
- 12) Instrumentation and Measurements Laboratory.
- 13) Computer Aided Design and Interactive Graphics Laboratory.

SUPPORTING FACILITIES

- 1) A well equipped precision Machine Shop staffed by 7 full-time machinists.
- 2) Central CDC CYBER 835 time sharing main frame. A separate pamphlet describing the hardware and software is available from the Computer Center.
- 3) Hybrid computer lab with an EAI 690 system staffed by a full-time simulation engineer and a technical assistant.
- 4) A dedicated VAX 11/780 computer with 512KB of core memory, two cartridge disk drives (28 MB each), and an additional Winchester disk drive of 675 MB; a Kennedy 800/1600 BPI magnetic tape drive and a NORPAK/VDP high performance, raster scan color video graphic system; a CALCOMP model 1012, 12" drum plotter; a tektronix model 4663, flat bed plotter; and several CRT's, micros etc.

MECHANICAL SYSTEMS

DESCRIPTION: Research work in mechanical systems at Concordia incorporates vibrations, machine tools, system design, mechanisms, noise analysis, preventive maintenance, computer-aided design and composite materials.

SCOPE OF WORK: Research, development, design with emphasis on production machinery and industrial applications.

FACILITIES: Fully instrumented Machine Tool Laboratory; Mechanical Vibrations Laboratory with 100 lb shaker system; low frequency, long stroke electro-hydraulic shaker; fully instrumented for noise and vibration analysis and shock testing; Measuring Laboratory with Taly-surf 4 and Talyrand 51; Kinematics and Dynamics Laboratory; hybrid computing system with direct link to laboratories; deep-hole machining and hydraulic copying research facilities; digital (CDC CYBER 835) and hybrid computers. Complete 2 channel real time FFT analyzer and modal analysis system with all supporting softwares. Acoustic emission test equipment, MTS fatigue tester, photoelastic polariscopes and strain gage instrumentation.

FACULTY:

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| M.O.M. Osman, Dr.sc.techn. (Swiss Fed. Institute) | Machine Tool Dynamics, Tribology Metal Cutting, Mechanisms & Gear Transmissions. |
| T.S. Sankar, Ph.D. (Waterloo) | Mechanics, Vibration Problems in Mechanical Systems and Reliability, Biomedical applications |
| G.D. Xistris, D.Sc.A. (Université de Montréal) | Machinery Reliability, Noise and Vibrations and Signal Processing. |
| S. Sankar, D.Eng. (Sir George Williams) | Computer-Aided Design, Vehicle Dynamics, Optimization and Vibration Control in System Design. |
| S.V. Hoa, Ph.D. (Toronto) | Vibration, Stress Analysis, Composite Materials, Finite Element Method. |
| A.E. Blach, Ph.D. (Université de Montréal) | Stress Analysis, Pressure Vessels and Piping, Heat Exchanger Design. |
| R.B. Bhat, Ph.D. (I.I.T., Madras) | Random Vibrations, Rotor Dynamics, Structural Acoustics. |

TYPICAL PROJECTS: Monitoring and analyzing noise and vibrations of industrial machinery, including thermal and vibratory stresses; preventive maintenance routines; analysis and design of energy absorption

devices for critical vibrations in machinery elements; unbalance response in rotating machinery; short-time acceptance tests for machine tools; evaluation of surface roughness of manufactured components and its influence on properties such as fatigue, bearing strength, lubricability, etc.; off-road vehicle seat suspension; active and semi-active suspension; motorcycle shock absorbers; CAD of complex mechanical systems through interactive graphics and Finite Element analysis; composite materials applications; fiberglass reinforced plastic pressure vessels; high damping composite materials.

THERMO-FLUID POWER AND PROPULSION

DESCRIPTION: Research encompasses experimental, analytical and computational work in combustion, solar energy, heat transfer, aerodynamics of turbomachinery.

SCOPE OF WORK: Development of modern computational techniques for the analysis of gas dynamic and transonic aerodynamic phenomena, especially in gas turbines and rocket motors; analysis and testing of phase-change, heat transfer processes; design and testing of solar heating and cooling systems; numerical methods in unsteady compressible flow; analysis of implosions, explosions and stability of moving shock waves.

FACILITIES: Wind Tunnels, Fluid Dynamics Laboratory; Thermodynamics Laboratory; Heat Transfer Laboratory; Solar Research Laboratory; Heat Pump Laboratory; Digital Computer and Terminal facilities, CDC CYBER 835; Combustion Laboratory; Shock Wave Dynamics Laboratory and associated instrumentation.

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| FACULTY: | W.G. Habashi, Ph.D. (Cornell) | Finite Element Applications in Aerodynamics, Computational Methods in Turbomachinery. |
| | K.I. Krakow, M.S. (Cal. Tech.) | Environmental Control, Solar Energy. |
| | S. Lin, D-Ing. (Karlsruhe) | Solar Energy, Heat and Mass Transfer Processes. |
| | R.A. Neemeh, Ph.D. (McGill) | Shock Wave Physics and Related Phenomena, Unsteady Wave Motion in Compressible Flow. |
| | A.J. Saber, Ph.D. (Princeton) | Study of Experimental Methods in Coal Gasification, Rocket Motor Instabilities. |

TYPICAL PROJECTS: Finite element computational study of aerodynamic flows at high subsonic and transonic Mach numbers; study of acoustic and structural phenomena in solid propellant rocket motors; resonance phenomena and their application; numerical methods in aerodynamics of turbomachines; air and solar source heat pumps; heat and mass transfer in porous media; energy transfer in confined vortex flows; ignition of gaseous mixtures by shock waves; testing of supersonic flow in compressor cascades; plasma dynamics.

INDUSTRIAL CONTROL SYSTEMS

DESCRIPTION: Industrial Control Systems incorporate pneumatics, fluidics, hydraulics, electronics and control engineering.

SCOPE OF WORK: Research, development, design and simulation with emphasis on sensing, measurement, automation and control applications in industry; low-cost automation with emphasis on production operation, mechanical transfer and handling; special purpose industrial "robots"; application of control theory and computer methods to the design and analysis of industrial control systems; computer-aided design interactive simulation.

FACILITIES: Well equipped research laboratory; experienced staff with design and prototype capability; low-cost automation laboratory open to industry contains about 30 working circuits of typical industrial applications to demonstrate the advantages and potential of new technology; digital and hybrid computer facilities.

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| FACULTY: | C.Kwok, Ph.D. (McGill) | Pneumatic and Fluidic Systems, Fluid Dynamics and Design. |
| | R.M.H. Cheng, Ph.D. (Birmingham) | Design and Analysis of Automation and Control Systems. |
| | J. Svoboda, D.Eng. (Concordia) | Fluid Controls, Hydraulic Systems and Flight Simulators. |
| | T. Krepec, D.T.Sc. (Warsaw) | Fuel Control Systems, Internal Combustion Engines. |
| | Y. Stepanenko, Ph.D. (Moscow) | Robotics |

MATERIALS IN MANUFACTURING

DESCRIPTION & SCOPE OF WORK: Hot working of metals encompasses the microstructural changes taking place inside the metals; the ductility and strength of various alloys; the simulation of multistage rolling and forging and the product properties. Mechanical behavior of fiber reinforced plastic composites; fatigue, fracture, creep and effect of environments; analysis using finite element method.

FACILITIES: Compression and torsion tests by means of microprocessor controlled equipment; optical and electron microscopy. Composite materials fabrication equipment; MTS fatigue testing machine, environmental chamber, photoelastic polariscope.

FACULTY: H.J. McQueen, Ph.D. Hot Working of Metals, Energy Conversion in Manufacturing, Energy Strategy, Solar Materials
(Notre Dame)

S.V. Hoa, Ph.D. Composite Materials, Stress Analysis, Dynamics.
(Toronto)

TYPICAL PROJECTS: Simulation of a hot reversing mill with up-coil furnaces; measurement and flow stress during passes and of softening between passes for both carbon steels and new high strength low-alloy steels. Fatigue and fracture of sheet molding components; fatigue and fracture of graphite/epoxy composites; effect of stress concentration on fracture strength of composite under uniaxial and biaxial loadings; effect of water absorption on the mechanical behavior of SMC and of graphite/epoxy composites; design methodology.

INDUSTRIAL ENGINEERING AND RELIABILITY IN SYSTEMS

DESCRIPTION: Research involves (i) development of efficient computational techniques for solving industrial engineering problems; (ii) modeling and performance evaluation of large industrial systems and (iii) reliability problems in systems.

SCOPE OF WORK: (i) Design, mathematical analysis and experimental evaluation of graph and discrete optimization algorithms for problems arising in industrial applications. These problems include: scheduling and sequencing of jobs, network reliability analysis, vehicle routing such as the travelling salesman problem, circuit lay-out, etc.... (ii) Studies in queuing networks and queuing network modeling of large systems such as computer systems. (iii) Investigation of reliability of mechanical systems using direct and indirect methods.

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| FACULTY: | K. Thulasiraman, Ph.D. (I.I.T., Madras) | Graph Theory, Discrete Optimization and Algorithms, Networks and Systems Theory. |
| | T.S. Sankar, Ph.D. (Waterloo) | Reliability Analysis and Mechanical Systems. |
| | M.N.S. Swamy, Ph.D. (Saskatchewan) | Graph Theory, Signal Processing, Networks and Systems Theory. |

TYPICAL PROJECTS: Optimal planar circuit layout; time-table and task scheduling; travelling salesman and routing problems; assembly-line balancing; topological design of computer networks; flow control problems in computer networks; probabilistic methods for reliability estimations for industrial machinery and production lines; failure forecasts for equipment and operation.

COMPUTER AIDED DESIGN, MANUFACTURING AND ROBOTICS

DESCRIPTION: CAD/CAM and Robotics is a developing area in Mechanical Engineering which deals with the use of micro-, mini- and large computers in the analysis, design and optimization of mechanical components and systems for application.

SCOPE OF WORK: Research, development, automated design, automated manufacturing, robotics and manipulators, vehicle design, simulation of industrial products.

FACILITIES: A dedicated VAX 11/780 computer with 512KB of core memory, two cartridge disk drives (28 MB each), and an additional Winchester disk drive of 675 MB; a Kennedy 800/1600 BPI magnetic tape drive and a NORPAK/VDP high performance, raster scan color video graphic system; a CALCOMP model 1012, 12" drum plotter; a tektronix model 4663, flat bed plotter; and several CRT's.

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| FACULTY: | S. Sankar, D. Eng. (Sir George Williams) | Computer Aided Design of Mechanical System, Dynamic Graphics in Vehicle Design, Optimal Design. |
| | R.M.H. Cheng, Ph.D. (Birmingham, U.K.) | Computer Aided Design of Fluid Systems, Automation, Robotics. |
| | V. Latinovic, D.Eng. (Concordia) | Computer Aided Manufacturing, Production Technology, Graphics. |
| | Y. Stepanenko, Ph.D. (Moscow) | Robotics and Manipulators, Simulation Methodologies. |

TYPICAL PROJECTS: Some specific research areas are:

- (i) Computer aided optimal design of transportation systems with reference to vehicle suspension performance.
- (ii) Finite element analysis and dynamic graphics in the design of off-road vehicle structures.
- (iii) CAD of sequential circuits for industrial processes.
- (iv) CAD of complex mechanical systems through interactive graphics and analysis.
- (v) CAD of rotor-bearing systems.
- (vi) CAD of pneumatic stepper motors and circuits.
- (vii) CAD of fiberglass reinforced plastic pressure vessels.
- (viii) CAD of industrial robots.
- (x) Computer controlled compliance robots.
- (xi) CADD scheduling, automated tolerancing.

PUBLICATIONS IN REFEREED JOURNALS (1980-1983)

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Bahgat, B.M., Osman, M.O.M. and Sankar, T.S., "An Approach for Dynamic Analysis of Mechanical Systems with Multiple Clearances Using Lagrangian Mechanics", Engineering Sciences, Division I.Mech.E., Vol. 197c, 1983, pp. 17-23.

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Bhat, R.B., and Sankar, T.S., "Effect of Stiffener Arrangement on the Random Response of a Flat Panel", 51st Shock and Vibration Bulletin, Paper No. 36, May 1981, pp. 81-87.

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Bhat, R.B., "Vibration of Panels with Nonuniformly Spaced Stiffeners", Journal of Sound and Vibration, Vol. 84, No. 2, 1982.

Bhat, R.B., Rao, J.S. and Sankar, T.S., "Workpiece Response in Turning Due to Spatially Moving Random Metal Cutting Forces", Mechanism and Machine Theory Journal, Vol. 17, No. 4, 1982, pp. 249-254.

Blach, A.E. and Bazergvi, A., "Methods of Analysis of Bolted Flanged Connections", WRC Bulletin, No. 271, October 1981, pp. 1-15.

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Cheng, R.M.H., Lee, R.S. and Luk, F.W., "A New Approach of Designing Programmable Sequential Controller", *Advances in Instrumentation*, Vol. 36, Part I, 1980.

Cheng, R.M.H., Kelly, M. and LeQuoc, S., "A Simulation for Logic Relay Circuits in Process Control", *Advances in Instrumentation*, Vol. 36, Part I, 1980.

Cheng, R.M.H., Kwok, C.K., Lee, R.S. and Haggag, Y., "Parameters Affecting the Frequency of a Fluid Oscillator", *Fluidics Quarterly* (in press), 1983.

Comeau, M. and Thulasiraman, K., "On Determining a Computable Ordering of a Digital Network", *Proceedings IEEE* (in press), 1983.

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Elgabry, A.A., Osman, M.O.M. and Sankar, T.S., "On the Use of the Ra, AMS and RMSS Values for the Simulation of Fine Machine Surfaces", *International Journal of Production Research*, Vol. 18, No. 5, 1980, pp. 571-581.

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Krepec, T. and Kwok, C.K., "Problems Encountered in the Development of a Double Cyclone Furnace", Proceedings of the 16th Southeastern Seminar on Thermal Sciences, Miami, Florida, April 19-21, 1982, pp. 181-191.

Krepec, T., "Fuel Control Systems for Hydrogen Fueled Combustion Engines - A Prognosis", Presented at First Canadian Hydrogen Workshop, Vancouver, B.C., May 9-10, 1983.

Kwok, C.K. and Vatistas, G.H., "A Computer Study of Multistable Cyclone Furnace Aerodynamics", Proceedings International Computer Technology Conference, San Francisco, Aug. 12-15, 1980, pp. 67-73.

Kwok, C.K. and Lee, R.S., "A Study of Variable Volume Pneumatic Capacitors", Eighth Jablonna Fluidics Conference, Bucharest, Romania, 1980.

Kwok, C.K. and Lee, R.S., "Novel Ball Type Fluid Control Components", IFAC Symposium on Pneumatic and Hydraulic Components and Instrumentation in Automatic Control, Poland, 1980.

Kwok, C.K. and Vatistas, G.H., "An Investigation of the Flow Pattern Within a Multi-Stable Cyclone Furnace", Eighth Canadian Congress of Applied Mechanics, Moncton, N.B., June 7-12, 1981, pp. 661-662.

Latinovic, V. and Osman, M.O.M., "Interactive CAD from Research Perspective", Proceedings 2nd Canadian CAD/CAM and Robotics Conference, Toronto, Ontario, May 31-June 2, 1983.

- Lee, R., Svoboda, J.V. and Kwok, C.K., "Computer Aided Analysis of Hydraulically Damped Check Valves", 8th Canadian Congress of Applied Mechanics, Moncton, N.B., June 1981, pp. 679-680.
- Lequoc, S. and Cheng, R.M.H., "Analysis of a Pneumatically Coupled Cam-Actuated Mechanism", Joint Automatic Control Congress, San Francisco, 1980.
- Lin, S., Wang, R.L. and Javory, Y., "An Experimental Investigation of Flashing Phenomena in a Depressurized Boiler", Proceedings of the 30th Canadian Chemical Engineering Conference, Vol. II: National Heat Transfer Symposium, Edmonton, October 1980, pp. 498-507.
- Lin, S., Lin, Y.Y. and Wang, R.L., "An Approximate Method for Determination of the Sublimation Limit in Simple Geometrical Porous Bodies", Drying '80, Vol. 2: Proceedings of the Second International Symposium, Montreal, July 1980, pp. 6-10.
- Lin, S., Sigalas, M. and Xistris, G.D., "Performance Evaluation of a Reciprocating Compressor through Blanked Suction Test Data", ASHRAE Semi-Annual Meeting, 1981, Chicago, Illinois.
- Lin, S., Kwok, C.K. and Vatistas, G., "The Characteristics of Energy Transfer Process Across a Latent-Heat Storage System Near Equilibrium State", ASME Computer Technology Conference, Minneapolis, Minn., September 1981.
- Lin, S. and Chou, T.H., "The Heat and Mass Transfer Characteristics of the Sublimation Process for Preservation of Activities of Biological Substances", Proceedings of the 7th International Heat Transfer Conference, Vol. 6, pp. 129-134, Munchen, Sept. 6-10, 1982.
- Lin, S. and Krakow, K.I., "Refrigerant Cooled Solar Collectors in a Solar Source Heat Pump System", Proceedings 9th Canadian Congress of Applied Mechanics, Saskatoon, Sask., May 30-June 3, 1983.
- MacDougall, A.C. and Cheng, R.M.H., "The Lightweight System - A Novel Concept for On-Board Weight and Balance Measurement Using Fibre Optics", 39th Conference of SAWE, Paper no. 1336, 1980.
- McQueen, H.J., Shapiro, M.M. and Feldman, D., "Selection of Materials for Flat Plate Solar Collectors", Materials to Satisfy the Energy Demand, ASME Metals Park, Ohio, 1981, pp. 851-889.
- McQueen, H.J., "Comparative Suitability of Materials for Simple Thermo-Solar Collectors", National Conference on Solar Energy, SESCO-Montreal, 1981, pp. 15-20.
- McQueen, H.J., Blach, A. and Hoa, S.V., "Structure of a Materials and Manufacturing Option in Mechanical Engineering at Both B.Eng. and M.Eng. Levels", 1981 ASEE Annual Conference Proceedings, Vol. 2, pp. 634-640, 1982 Proceedings 3rd Canadian Conference on Engineering Education, Saskatoon (in press).

McQueen, H.J. and Hutchinson, W.B., "Recovered Substructures in Hot Worked Aluminum as Observed by SEM Channelling Contrast", Deformation of Polycrystals, Riso National Laboratory, Denmark, 1981, pp. 335-342.

McQueen, H.J., "Dynamic Recrystallization of Copper Observed by SEM Channelling Contrast", Strength of Metals and Alloys (ICSMA 6), (R.C. Gifkins) Pergamon Press, Oxford, 1982, pp. 517-522.

McQueen, H.J., "Discontinuity Sources in Manufacturing Processes", Proceedings International Conference on Defects, Fracture and Fatigue, Mont Gabriel, May 1982, Inst. Fracture and Solid Mechanics, Lehigh University, Bethlehem, 1982, 12 pages (in press).

McQueen, H.J., "Comparison of Canadian and Quebec Energy Strategies", Proceedings CSME Annual Congress, Calgary, 1980, pp. 59-65.

McQueen, H.J. and Lindsay, J.F., "Educating Engineers in the Assessment and Control of Indirect Impacts", Frontiers in Education Conference Proceedings IEEE-ASEE, 1980, pp. 535-541.

McQueen, H.J. and Farina, C., "Improving the Industrial Relevance of University Research Through a Shift in Funding Priorities: A Case Study of Metallurgy in Britain and Canada", ASEE Annual Conference Proceedings, 1981, Vol. 3, pp. 1048-1052.

McQueen, H.J., "Industry Oriented Liberal Studies for Engineers: Socio-Technical Studies", ASEE Annual Conference Proceedings, 1981, Vol. 2, pp. 760-765, Proceedings 3rd Canadian Conference on Engineering Education, Saskatoon (in press), 1982.

Naidu, M.G.G., Reddy, P.S. and Thulasiraman, K., "Similarity of Graphs and Enumeration of Distinct nth Order Symmetric Sign Patterns", Proceedings IEEE International Symposium on Circuits and Systems, Rome, May 1982.

Osman, M.O.M., Bahgat, B.M. and Sankar, T.S., "On the Prediction of Journal-Bearing Separation in High Speed Mechanisms with Clearances", Proceedings ASME Winter Annual Meeting, Paper No. 80-WA/DSC-36, Chicago, November 1980.

Osman, M.O.M. and Chahil, G.S., "On the Effect of Coolant Passage Configuration in Gun Drilling Operations", Proceedings First International Conference on Production Engineering Design and Control, Paper No. MCTO-9, Vol. II, Alexandria, Egypt, December 17-29, 1980.

Osman, M.O.M. and Chahil, G.S., "An Experimental Investigation of the Stochastic Fluctuations of Torque and Thrust in Twist Drills", Proceedings First International Conference on Production Engineering Design and Control, Paper No. MCTO-3, Vol. II, Alexandria, Egypt, December 27-29, 1980.

Osman, M.O.M., Bahgat, B.M. and Sankar, T.S., "The Effect of Bearing Clearances on the Dynamic Response in Gearing", Proceedings International Symposium on Gearing and Power Transmission, Tokyo, Japan, Aug.30-Sept.3, 1981.

- Rao, J.S., Bhat, R.B. and Sankar, T.S., "Unbalance Response of a Rotor in Hydrodynamic Bearings with Damping", Eighth Canadian Congress on Applied Mechanics, Moncton, N.B., June 7-12, 1981.
- Sankar, S. and Svoboda, J., "Active Stabilization of a Ship-Borne Crane", 51st Shock and Vibration Symposium, San Diego, October, 1980.
- Sankar, S. and Guntur, R., "Pneumatic Vibration Control Using Active Force Generators", 51st Shock and Vibration Symposium, San Diego, October, 1980.
- Sankar, S., Guntur, R. and Sankar, T.S., "Dynamic Behaviour of Road Vehicles Under Different Slip Conditions", 5th Symposium on Engineering Applications of Mechanics, Ottawa, June, 1980.
- Sankar, S., Sankar, T.S. and Young, R., "Computer-Aided Analysis of Shock Isolation Systems", Proceedings 12th Annual Conference on Modeling and Simulation, Paper No. 5-B-1, Pittsburgh, April, 1981.
- Sankar, S., Guntur, R. and Kalambur, S.G., "Non-Linear Pneumatic Force Generators for Vibration Control", 52nd Shock and Vibration Symposium, New Orleans, October, 1981.
- Sankar, S. and Judek, T.J., "Computer-Aided Engineering Concept in the Analysis and Design of Vehicles", Invited Paper, 97th Congress of the Engineering Institute of Canada, Quebec, April 25-27, 1983.
- Sankar, T.S., Jha, V.K. and Bhat, R.B., "An Analytical Model for Input Spectral Densities for Response Estimation", Proceedings Canadian Acoustical Conference, Montreal, October, 1980.
- Sankar, T.S., Hoa, S.V. and Fabrikant, V.I., "Approximate Solution of Singular Integro-Differential Equations in Elastic Contact Problems", Eighth Canadian Congress of Applied Mechanics, Moncton, N.B., June 8-12, 1981.
- Sharan, A., Sankar, T.S. and Sankar, S., "Dynamic Behaviour of Lathe Spindles with Elastic Supports Including Damping by Finite Element Analysis", Proceedings 51st Shock and Vibration Symposium, San Diego, October, 1980.
- Sharan, A.M., Sankar, S. and Sankar, T.S., "Optimum Selection and Location of Bearings in a Lathe Spindle Under Random Cutting Forces" (abstract only), Proceedings Eighth Canadian Congress of Applied Mechanics, Moncton, N.B., June 8-12, 1981.
- Svoboda, J., Sankar, S. and Blach, W., "Hybrid Computer-Aided Design of Hydrostatic Vehicle Drive with Energy Accumulator", ASME Design Engineering Conference, Paper No. 80-DET-49, Beverley Hills, California, September, 1980.
- Svoboda, J. and Sankar, S., "Design of a Shipborne Crane with Active Motion Stabilization", 6th International Fluid Power Symposium, BHRA, Cambridge, U.K., April 1981.

Subbiah, R., Bhat, R.B. and Sankar, T.S., "Unbalance Response of a Single Mass Rotor Mounted on Dissimilar Hydrodynamic Bearings", 53rd Shock and Vibration Symposium, Danvers, MA, October 26-28, 1982.

Thulasiraman, K., "A Spanning Tree Enumeration Algorithm and Some Combinational Questions", Invited Lecture, South East Asian Colloquium on Graph Theory, Department of Mathematics, National University of Singapore, Singapore, May 1983.

To, C.H. and Krepec, T., "Evaluation of Diesel Injector Dynamic Response as the Nozzle Quality Measure", Ninth Canadian Congress of Applied Mechanics, Saskatoon, Sask., May 30-June 3, 1983.

Van Vliet, M. and Sankar, S., "Computer-Aided Analysis and Experimental Verification of a Motorcycle Suspension", ASME Design Engineering Technical Conference, Paper No. 81-DET-84, September, 1981.

Vatistas, G., Kwok, C.K. and Lin, S., "Determination of the Imposed Exit Boundary Conditions Accounting for Flow Reversal in Vortex Chamber - Numerical Modelling", ASME Computer Technology Conference, CAD/CAM and Robotics, Minneapolis, Minn., September 27-30, 1981.

Vatistas, G.H., Lin, S. and Kwok, C.K., "Numerical Solution for Combustion Flowfields, A Simple Approach", 10th IMACS World Congress on System Simulation and Scientific Computation, Montreal, Canada, August 8-13, 1982.

Vatistas, G.H., Lin, S., Kwok, C.K. and Lilley, D.G., "Bluff-Body Flameholder Wakes: A Simple Numerical Solution", AIAA/ASME/SAE Joint Propulsion Conference, Paper No. 82-1177, Cleveland, June 21-23, 1982.

Warner, G. and Sankar, T.S., "Some Modalities of Injury in the Human Hand to Mechanical Vibration" (abstract only), Proceedings Eighth Canadian Congress of Applied Mechanics, Moncton, N.B., June 8-12, 1981.

Xistris, G.D. and Sankar, T.S., "An Experimental Evaluation of Direct and Indirect Methods for Assessing Machinery Condition", Proceedings 1980 ASME International Conference on Reliability, Stress Analysis and Failure Prevention, Century 2 Conferences, San Francisco, August, pp. 46-50, 1980.

PROFESSIONAL ACTIVITIES

BHAT, R.B.

Reviewer of papers for IMACS, Transactions of CSME, CANCAM'81 and ASME Vibrations Conference 1981.

Alternate Member, Canadian Machinery Dynamics Subcommittee.

Chairman, Audiovisual Aids Committee, 10th IMACS Congress, Montreal, 1982.

Member, American Society of Mechanical Engineers.

BLACH, A.E.

Member, Ordre des Ingénieurs du Québec.

Member, Canadian Society for Mechanical Engineers.

Associate Member, American Society of Mechanical Engineers.

Served on Subcommittee on Bolted Flanged Connections, Welding Research Council.

Served on CIDA Industrial Engineering Program to train staff from University of West Indies.

Consultant for various projects in Canada and overseas in the area of Heat Exchangers, Pressure Vessels and Process Piping.

CHENG, R.M.H.

Member, Institution of Mechanical Engineers.

Senior Member, Instrument Society of America.

Member, American Society of Mechanical Engineers.

Member, Institute of Electrical and Electronics Engineers.

Reviewer of papers for ASME and IEEE Transactions.

Member, Technical Committee IEEE on Control Theory.

Consultant, DSL-Dynamic Sciences Limited.

HABASHI, W.G.

Consultant, Pratt & Whitney Canada Inc., Aerodynamics Department.

Member, Ordre des Ingénieurs du Québec.

Member (elected), Sigma-Xi, Scientific Research Society of North America.

Member, The American Society of Mechanical Engineers.

Member, The American Institute of Aeronautics and Astronautics.

Member, CAMAQ Committee, and CAMAQ Subcommittee on Joint M.Eng.

Program in Aerospace Engineering.

Member, Editorial Board, International Journal for Numerical Methods in Fluids.

Reviewer of papers for AIAA Journal, International Journal for Numerical Methods in Engineering, CASI Transactions, CSME Transactions, International Journal for Numerical Methods in Fluids.

Organizing Committee, Third International Conference on Numerical Methods in Laminar and Turbulent Flow, Seattle, 1983.

HOA, S.V.

Member, ASME Boiler and Pressure Vessel Code, Section X Committee.
Reviewer of papers for Journal of Polymer Composites, AIAA, Journal of Sound and Vibration, 8th and 9th Canadian Congress of Applied Mechanics, Transactions of the Canadian Society for Mechanical Engineering, Zentralblatt fur Mathematik.
Social Program Chairman, 10th IMACS Congress, Concordia University, Montreal, 1982.
Member, Organizing Committee, 7th International Conference on the Strength of Metals and Alloys, to be held at Concordia University, Montreal, 1985.
SAE Student Faculty Advisor (1980-81); CSME Student Faculty Advisor.
Consultant for Persta Canada Ltd., CPF Dualam Ltd., Voyageur Marine Construction Ltd., Q Plastic Inc., Spar Aerospace Ltd.

KRAKOW, K.I.

Consultant on various heat pump research projects.
Reviewer for Journal of Canadian Society of Agricultural Engineering.
Examiner for Order of Engineers of Quebec.
Treasurer, American Society for Engineering Education, St. Lawrence Section.

KATZ, S.

Reviewer of papers for ASME.
Consultant - Photovac Incorporated.

KREPEC, T.

Member, Selection Committee for France-Quebec Cooperative Programs.
Faculty Advisor for Student Section, Society of Automotive Engineers.

LIN, S.

Reviewer of papers for Journal of Heat Transfer (ASME Transactions) - 7th International Heat Transfer Conference, and for projects of the National Science Foundation.
Recipient of DAAD (German Academic Exchange Service) Fellowship for research work conducted in West Germany, University of Stuttgart, June to August 1981.
Industrial Consultant - Cargo Marine Inc., Montreal and Geothermal System Inc. Sorel.

McQUEEN, H.J.

Administrateur du Bureau : Ordre des Ingénieurs du Québec.
Chairman - Montreal Chapter ASM 1981-82.
Consultant - Faculty of Engineering, University of West Indies, Trinidad for Materials and Manufacturing Program administered under CIDA.
Vice-President - American Society of Metals, Montreal.
Member - Committee on Careers in Metallurgy, ASM, Montreal.

NEEMEH, R.A.

Consultant, Iron Ore Company of Canada Ltd.
Member, Senate Library Committee, Concordia University.

OSMAN, M.O.M.

Member, Executive Council of IFToMM.
Member, Editorial Board, CSME-Transactions.
Reviewer of Papers for AMR, ASME, CSME-Transactions and Journal of
Machines and Mechanisms.

SABER, A.J.

Member, Board of Directors, Lignasco Resources Ltd., Toronto.
Member, Board of Directors, Kaolin of Canada Ltd.
Consultant, DRES, Suffield, Ralston, Alberta.
Consultant, Donald R. Martyn and Associates, Toronto.

SANKAR, S.

Reviewer, Zentralblatt for Mathematik.
Associate Editor, Simulation Journal.
Selected Reviewer, Applied Mechanics Review.
Session Organizer, 11th Annual Pittsburgh Conference on Modeling and
Simulation, Montreal, 1980.
Co-Chairman, 10th International Conference on Mathematics and Computer
Simulation, Montreal, 1982.
Executive Member, The Canadian Council of Theory of Machines and
Mechanisms.
President, The International Society for Mathematics and Computer
Simulation, (IMACS/CANADA).
Consultant, Centre de Recherche Industrielle du Québec.
Consultant, Voyageur Transport Development Corporation, Montreal.
Consultant, VIA RAIL, Montreal.
Consultant, Performance Sailcraft Inc., Montreal.
Consultant, Bombardier Ltd., Recreational Products Division.

SANKAR, T.S.

Reviewer of Papers, Canadian Congress of Applied Mechanics, ASME
Conferences and Transactions, Journal of Sound and Vibrations, CSME
Transactions, IFToMM.
Reviewer, Shock and Vibration Bulletins and Conferences.
Reviewer, Research Proposals for National Science Foundation, U.S.A.
Paper Review Co-Chairman and Session Chairman, 8th Vibrations and
Design Engineering Technical Conference, ASME, Hartford, September
1981.
Member, Editorial Board, International Journal of Diagnostic
Engineering, U.K.
Consultant, Separator Engineering Ltd.; National Research Council of
Canada; ABCO Plastics Ltd; Government of India.

Session Coordinator, XVth International Congress of Theoretical & Applied Mechanics, Toronto, August 1980.
Session Chairman, Designing With Composites, 1980 ASME Eastern Design Engineering Conference, New York, October 1980.
Chairman, Session on Bio and Sports Mechanics, 8th CANSAM, 1981.
Member, Organizing Committee and Session Chairman, 6th Seminar on Vibration Standards & Balancing, MDSC, NRC, Toronto, Sept. 1980.
Member, Organizing Committee and Canadian Representative, 8th Vibrations Conference and Design Engineering Technical Conference of the ASME, Hartford, Sept. 1981.
Vice-President, CSME, 1979 to date.
Member, NRC Subcommittee on Turbomechanics and Machinery Dynamics, 1977 to date.
Member, Mechanisms Committee, ASME, 1977-80, and Member, Vibrations Committee, ASME, 1979 to date.
Lectures on 'Seminar in Mechanics', at McGill University and Ecole Polytechnique.
Chairman, Machinery Dynamics Subcommittee of NRC.
Member, Associate Committee on Propulsion, National Research Council.
Chairman and Organizer, 7th Seminar on Rotor Dynamics, National Research Council, Edmonton, October 1982.
Advisory Board, 10th IMACS World Congress, Montreal, August 1982.

SVOBODA, J.

Director, Festo Pneumatic, West Germany.
Assessor, Australian Research Committee.
Consultant, Ritepro Inc., National Engineering Laboratory, U.K., and Festo-Pneumatic, West Germany.
Session Co-Chairman, 12th Modelling and Simulation Conference, Pittsburgh, April 1981.

THULASIRAMAN, K.

Reviewer, Mathematical Reviews, U.S.A.
Reviewer of papers for IEEE Transactions on Circuits and Systems, Canadian Electrical Engineering Journal.
Examiner, Ph.D. Thesis, Indian Institute of Technology, Bombay, India.
Invited Lecturer on 'Graph Theory', South East Asian Conference on Graph Theory, Singapore, May 1983.
Invited Lecturer, University of Toronto and Pennsylvania State University.

XISTRIS, G.

Member, OIQ Committee of Examiners and FCAC Engineering Grants Evaluation Committee.
Consultant, DND (Navy), Commission de la santé de la sécurité au travail, MARCOM (Fleet Training School), Weir Ltd., Government of Nova Scotia.

DOCTORAL THESES COMPLETED

1980-81

HASHISH, E.A. "Improved Mathematical Models and Dynamic Analysis of Light Rotor-Bearing Systems Under Unbalance and Stochastic Excitation". (Supervisors: T.S. Sankar and M.O.M. Osman).

1981-82

JHA, V.K. "Optimum Design of Satellite Antenna Structures Subjected to Random Excitations". (Supervisor: T.S. Sankar).

SHARAN, A.M. "Dynamic Response and Optimal Design of a Lathe Spindle Under Experimentally Measured Random Cutting Force Excitations". (Supervisors: S. Sankar and T.S. Sankar).

1982-83

FAHIM, A.E. "Design, Analysis and Performance Evaluation of a Polar-Based Contouring System". (Supervisors: R.M.H. Cheng and S. Sankar).

MASTER OF ENGINEERING STUDENTS GRADUATED

1980-1983

AWAD, S.A. "Experimental & Theoretical Investigations of Fluidic Igniters By Use of a Shock Tube". (Supervisor: K.I. Krakow).

BHARDWAJ, R. "Prediction of Combustion of Single Fuel Droplet Using Diffusion Models". (Supervisor: S. Lin).

VATISTAS, G.H. "Computational Flow Prediction in Cyclone Chambers". (Supervisor: S. Lin).

EL-SHAKWEER, A.A. "Fatigue Life Prediction Under Complex Loadings". (Supervisor: S.V. Hoa).

KOTB, M.M. "Bounce Response of Canadian Maglev Vehicle Under Periodic and Stochastic Excitations from the Guideways". (Supervisor: T.S. Sankar).

CASANOVA, J.A. "Wind Effects on Stacks and Columns". (Supervisor: A.E. Blach).

CALOCEROPOULOS, C. "Design of a Hydrostatic Actuator for Use in Flight Simulation Motion Systems". (Supervisor: G.D. Xistris and J. Svoboda).

McLEAN, L.A. "A Finite Element Solution of the Laminar Flame Equations at the Lower Flammability Limit". (Supervisor: A.J. Saber).

HULET, J. "A Comparative Study Between Two-Dimensional and Axisymmetrical Turbulent Boundary Layers with Respect to the Law of the Wall, the Velocity Defect Law, and the Average Shear Coefficients". (Supervisors: M.P. duPlessis and S. Katz).

POLITIS, M.P. "Pneumatic Conveying and Dust Control of Bulk Materials". (Supervisor: J. Svoboda).

SALIB, A.M. "Stress Analysis of Telescopic Hydraulic Cylinders". (Supervisor: S. Sankar).

HO, A. "A Study on the Effects of Leakage for Scaled-Down Brakepipe Model". (Supervisors: R.M.H. Cheng and S. Katz).

ROSEN, J. "The User of Peat as an Energy Source for a Small Remote Community". (Supervisor: S. Lin).

LUONG, T.T. "Elastic and Creep Buckling Analysis of Load Carrying Columns by the Finite Element Method". (Supervisor: S.V. Hoa).

KENNEDI, L. "Analysis of Gear Tooth Deflection and Stress". (Supervisor: S.V. Hoa).

BADRUDDIN, S. "An Improved Profile of the Railway Wheel to Minimize Residual Stress after Service Drag Braking". (Supervisor: R.M.H. Cheng and S.V. Hoa).

REHMAN, Altef U. "Kinematics of Methane-Air Combustion at Lower Flammability Limit". (Supervisor: A.J. Saber).

CHANG, T.G.K. "Production Planning and Manpower Forecast System - A Case Study". (Supervisor: M.O.M. Osman).

ANDRAOUS, R. "Fiber Reinforced Plastic Materials", Technical Report. (Supervisor: S.V. Hoa).

LEE, R. "Dynamic Performance of Hydraulically Damped Swing-Disk Check Valve". (Supervisor: J. Svoboda).

AULA, V. "Single-Fault Location Methods Applied to Brake Pipe Models". (Supervisors: R.M.H. Cheng and S. Katz).

RYAN, N. "Deformation Behavior of Types 304, 316, and 317 Austenitic Stainless Steels During Hot Torsion". (Supervisor: H. J. McQueen).

LAMBROU, A. "Production of Supersonic Flows by the Use of a Simple Shock Tube". (Supervisor: R.A. Neemeh).

BOUCHARD, G. "Analytical and Experimental Investigation of Gas-Charged Hydraulic Accumulators". (Supervisors: J. Svoboda and S. Katz).

SHENOUDA, H.E. "Energy Conservation in Metal Finishing". (Supervisor: H.J. McQueen).

DRES, D. "Development of a Mathematical Model for the Moving Grate in Duration of Iron Ore Pellets". (Supervisor: R.A. Neemeah)

EFTHIMIOPOULOS, T. "Design and Performance of a Double Diaphragm Shock Tube for Supersonic Compressor Cascade Testing". (Supervisor: R.A. Neemeah).

EL-TOHAMY, A. "The Effect of Bearing Clearances in the Dynamic Analysis of Mechanisms". (Supervisor: M.O.M. Osman).

MERINO, H. "Energy Saving on a Cooling System". (Supervisor: S. Lin).

DHIR, A. "Fuel for CANDU Reactor". (Supervisor: S. Lin).

PRADO, E. "Investigation of Linear Electro-Hydraulic Servo-Actuator". (Supervisors: J. Svoboda and G.M. McKinnon).

SPATHIS, N. "Design Consideration for Gas Turbines". (Supervisor: G.D. Xistris).

BROSSEAU, J.G. "The Effect of Material Properties on the Thermal Efficiency of a Rankine Cycle with Solar Collectors as Heat Sources". (Supervisor: S. Lin).

MOUSHIAN, S.M. "Energy Efficient Greenhouse Design". (Supervisor: S. Lin).

POLYMEROU, A. "Use of Blended Residual Fuels in Diesel Electric Locomotives". (Supervisor: T. Krepec).

RESEARCH GRANTS

| Grantee | Amount Awarded in the Academic Year | | | Granting Agency |
|---------|-------------------------------------|---------|---------|-----------------|
| | 1980-81 | 1981-82 | 1982-83 | |

(a) Individual Operating Grants

| | | | | |
|------------------|----------|----------|----------|-------|
| Bhat, R.B. | — | \$10,000 | \$11,200 | NSERC |
| Cheng, R.M.H. | \$18,752 | 24,000 | 27,720 | NSERC |
| duPlessis, M.P. | 19,764 | 21,740 | — | NSERC |
| Guntur, R.R. | 10,000 | 11,000 | — | NSERC |
| Habashi, W.G. | 12,000 | 13,200 | 15,246 | NSERC |
| Hoa, S.V. | 10,980 | 12,078 | 16,900 | NSERC |
| Katz, S. | 14,774 | 16,500 | 19,058 | NSERC |
| Krakow, K.I. | — | — | 3,400 | NSERC |
| Krepec, T.H. | — | 12,000 | 17,700 | NSERC |
| Kwok, C.K. | 31,500 | 34,650 | 40,021 | NSERC |
| Lequoc, S. | — | — | 6,700 | NSERC |
| Lin, S. | 13,176 | 14,494 | 20,200 | NSERC |
| McKinnon, M. | 7,500 | 8,750 | 16,450 | NSERC |
| McQueen, H.J. | 11,500 | 12,650 | 14,611 | NSERC |
| Neemeh, R.A. | 9,333 | 10,266 | 14,450 | NSERC |
| Osman, M.O.M. | 26,000 | 28,600 | 33,033 | NSERC |
| Saber, A.J. | 9,660 | 10,000 | 7,750 | NSERC |
| Sankar, S. | 13,176 | 14,494 | 21,850 | NSERC |
| Sankar, T.S. | 21,411 | 23,552 | 30,900 | NSERC |
| Svoboda, J. | 9,660 | 13,000 | 15,015 | NSERC |
| Thulasiraman, K. | — | — | 11,292 | NSERC |
| Wu, J.H.T. | 11,000 | 17,050 | — | NSERC |
| Xistris, G.D. | 10,431 | 11,474 | 15,100 | NSERC |

(b) Group Operating Grants

| | | | | |
|--------------------|---|--------|--------|-----------|
| Kwok, C.K. (Group: | — | 15,000 | 21,800 | DGES-FCAC |
| R.M.H. Cheng | | | | |
| S. Katz | | | | |
| J. Svoboda | | | | |
| T. Krepec | | | | |

| Grantee | Amount Awarded in the Academic Year | | | Granting Agency |
|--|-------------------------------------|---------|---------|-----------------|
| | 1980-81 | 1981-82 | 1982-83 | |
| Kwok, C.K. (Group: R.M.H. Cheng J. Svoboda S. Katz P.M. Lee) | \$15,000 | \$ — | \$ — | DGES-FCAC |
| Osman, M.O.M. (Group: T.S. Sankar G.D. Xistris S. Sankar S.V. Hoa) | 31,000 | 36,300 | 36,300 | DGES-FCAC |
| (c) <u>Equipment Grants</u> | | | | |
| Kwok, C.K. (Group: R.M.H. Cheng J. Svoboda S. Katz P.M. Lee) | 2,100 | — | 4,500 | DGES-FCAC |
| Cheng, R.M.H. | — | 38,686 | — | NSERC |
| Osman, M.O.M. (Group: T.S. Sankar G.D. Xistris S. Sankar S.V. Hoa) | 12,800 | — | 11,900 | DGES-FCAC |
| Hoa, S.V. | 40,000 | 13,603 | — | NSERC |
| Sankar, T.S. | — | 79,584 | — | NSERC |
| Krepec, T.H. | — | — | 32,778 | NSERC |
| Lin, S. | — | — | 16,500 | NSERC |
| Svoboda, J. | — | — | 39,580 | NSERC |
| (d) <u>Special Grants</u> | | | | |
| Habashi | 26,000 | — | 56,500 | NSERC PRAI |
| Hoa, S.V. | — | 60,000 | 46,350 | NSERC PRAI |
| Kwok, C.K. | 45,457 | — | — | NSERC STRATEGIC |
| Lin, S. & Krakow, K. | 18,337 | 19,201 | 45,946 | NSERC STRATEGIC |
| Neemeh, R.A. | — | 70,500 | 60,000 | NSERC PRAI |
| Sankar, S. | 54,150 | 87,875 | 94,500 | NSERC PRAI |
| Svoboda, J. | 46,000 | 160,000 | 100,000 | NSERC PRAI |

| Grantee | Amount Awarded in the Academic Year | | | Granting Agency |
|---|-------------------------------------|---------|---------|--|
| | 1980-81 | 1981-82 | 1982-83 | |
| (e) <u>Other Grants & Contracts</u> | | | | |
| Bhat, R.B. | \$ — | \$ — | \$ 343 | CASA |
| Blach, A.E. | — | — | 501 | CASA |
| Blach, A.E. | 6,700 | — | — | PVRC GRANT 82-19 |
| Fabrikant, V.I. | — | — | 1,570 | CASA |
| Hoa, S.V. | — | — | 400 | CONCORDIA UNIVERSITY TEACHING & DEVELOPMENT |
| Hoa, S.V. | 14,630 | — | — | NATIONAL RESEARCH COUNCIL |
| Hoa, S.V. | — | 5,500 | 2,000 | SPAR AEROSPACE |
| Hoa, S.V. | — | — | 320 | CASA |
| Hoa, S.V. | — | — | 8,000 | IMPERIAL OIL |
| Krakow, K. & Lin, S. | 15,000 | — | — | CANADA EMPLOYMENT & IMMIGRATION |
| Krakow, K. & Lin, S. | — | — | 77,221 | DEPARTMENT OF SUPPLY AND SERVICES |
| Krakow, K. & Lin, S. | 36,550 | 17,900 | 8,700 | ASHRAE |
| Krakow, K.I. | — | — | 4,350 | ASHRAE |
| Latinovic, V. | — | — | 2,500 | CASA |
| McQueen, H.J. | — | — | 660 | CASA |
| Saber, A.J. | 21,405 | — | — | DEPT. OF NATIONAL DEFENCE |
| Sankar, S. | — | 11,500 | — | BOMBARDIER INC. |
| Sankar, S. & Bhat, R. | 1,680 | — | — | CONCORDIA UNIVERSITY TEACHING & DEVELOPMENT |
| Sankar, S. | 2,000 | — | — | VOYAGEUR ENTERPRISES |
| Sankar, S. | — | — | 408 | CASA |
| Stepanenko, Y. | — | — | 3,000 | CASA |
| Svoboda, J. | — | 11,500 | 15,000 | CAE ELECTRONICS |
| Thulasiraman | — | — | 3,315 | CASA |

HONOURS, AWARDS AND FELOWSHIPS

UNDERGRADUATE AWARDS (1980-83)

i) Mechanical Engineering Medal Winners

| | | | |
|-----------------|--------|----------------------|---------|
| V.R. Tata | B.Eng. | "Morris Chait Medal" | (1981). |
| V.R. Tata | B.Eng. | "Mechanical Medal" | (1981). |
| Bao Q. Nguyen | B.Eng. | "Mechanical Medal" | (1982). |
| H.G. McAllister | B.Eng. | "Mechanical Medal" | (1982). |
| S. Mah | B.Eng. | "Mechanical Medal" | (1983). |
| S. Mah | B.Eng. | "Morris Chait Medal" | (1983). |

ii) Fellowships and Scholarships

| | |
|--------------|--|
| Cong Hiep To | The American Association of Costs Engineers (1981/82). |
| Ngoc Lan Vu | Birks Family Foundation Bursary (1981/82; 1982/83). |
| M. Marciano | J.P. Copland Memorial Busary (1981/82). |
| Jane Andrews | Ethel Campbell-P.E.O. Memorial Bursary (1980/81). |

iii) NSERC Undergraduate Summer Research Awards

| <u>1981</u> | <u>1982</u> | <u>1983</u> |
|---------------|---------------|----------------|
| J. Alanoly | Cong Hiep To | G. Rohrauer |
| W. Genadry | A. Gee | Cong Hiep To |
| L.C. Giardina | G. Guèvremont | Ngoc Lan Vu |
| Bao Q. Nguyen | S. Mah | John Valass |
| | Bao Q. Nguyen | A.A. Ortaaslan |
| | R. Krepec | |
| | R. Pellizzari | |
| | T. Veto | |
| | Ngoc Lan Vu | |

iv) Undergraduate Honours Students

| | |
|-----------------|------------------|
| S.K. Aivaliotis | With Distinction |
| S. Blach | With Distinction |
| A.I. Georgantas | Cum Laude |
| V.R. Tata | With Distinction |
| M.A.P. Yahya | With Distinction |
| M.G. Quinlan | With Distinction |
| W.A. Greenwood | With Distinction |
| M.G. McAllister | With Distinction |
| O.A. Adeleke | With Distinction |
| J. Alanoly | With Distinction |
| W.P. Lytwyn | With Distinction |
| Bao Q. Nguyen | With Distinction |

iv) Undergraduate Honours Students (continued)

| | |
|------------------------|------------------------|
| P. Ouellette | With Distinction |
| R.F. Palardy | With Distinction |
| G. Reis | With Distinction |
| F.J. Zanfino | With Distinction |
| Hussain M.H. Almahroos | With Distinction |
| Susan Bamford | With Distinction |
| W.L. Clarke | With Distinction |
| Y.J.R. Courbet | With Distinction |
| Jull Dunleavy | With Distinction |
| Fon-mon Fong | With Distinction |
| W.F. Genadry | With Distinction |
| S. Mah | With Great Distinction |
| F. Paoletti | With Distinction |
| R. Pellizzari | With Distinction |
| P.I. Setiawan | With Distinction |

GRADUATE AWARDS (1980-83)

i) NSERC Post Graduate Awards

A.K.W. Ahmed
M.B. Elgobhary
R.O. Blakely
M.M. Korb
N. Krouglicof
C.Y. Li
M. McAllister
S. Rakheja
M. van Vliet
G.H. Vatishtas
V. Tata
Bao Q. Nguyen

ii) Government of Quebec Post-Graduate Scholarships

A. Fahim
M. Lucking
Bao Q. Nguyen
S. Rakheja
M. van Vliet

iii) Transport Canada Scholarships

M. van Vliet
W.K. Ahmed
S. Rakheja
Bao Q. Nguyen

GRADUATE AWARDS (continued)

iv) Concordia Fellowships

S. Arumugam
S. Chandrashekhar
S. Rakheja
R. Subbiah
M. van Vliet
Bao Q. Nguyen
V. Tata

v) Concordia Graduate Teaching Fellowships

A.K.W. Ahmed
A. Georgantas
M. Kotb
N. Krouglicof
S. Rakheja
M. van Vliet

OTHER AWARDS

| | |
|--|----------------------------|
| ASHRAE-Homer Addams Award | 1982 - Shimaio Ni |
| David Azrieli Graduate Fellowship | 1982/83 - V. Tata |
| Concordia Graduate Awards Travel Grant | July 1983 - M. Lucking |
| The F.A. Gerard Prize | 1982 - L.A. McLean, M.Eng. |

SPECIAL INVITED LECTURERS AND INDUSTRIAL SEMINARS

| | |
|-----------------------|---|
| Dr. M.P. duPlessis | Alberta Research Council, Edmonton, Alberta |
| Dr. G.M.L. Gladwell | University of Waterloo, Waterloo, Ontario |
| Mr. A.I. Ivlyushov | International Civil Aviation Organization, Montreal, Quebec |
| Prof. M.J. Crocker | Purdue University, W. Lafayette, Indiana, U.S.A. |
| Prof. B.S. Dhillon | University of Ottawa, Ottawa, Ontario |
| Mr. H. Halton | Canadair Limited, Montreal, Quebec |
| Dr. M. Carver | Atomic Energy of Canada Ltd., Chalk River, Ontario |
| Prof. R. Vichnevetsky | Rutgers University, New Brunswick, New Jersey, U.S.A. |
| Dr. A.N. Sherbourne | University of Waterloo, Waterloo, Ontario |
| Mr. Colin B. Wrong | Pratt and Whitney Aircraft of Canada Ltd., Montreal, Quebec |
| Mr. D. Hawes | Aviation Electric Limited, Montreal, Quebec |
| Dr. M. McKinnon | CAE Electronics Limited, Montreal, Quebec |
| Dr. J. Zieryep | Karlsruhe University, West Germany |
| Dr. J.S. Rao | IIT Delhi, New Delhi, India |
| Dr. H.K. Kesavan | University of Waterloo, Waterloo, Ontario |
| Dr. N.S. Sridharan | Rutgers University, New Brunswick, New Jersey, U.S.A. |